National Institute of Technology Rourkela

Synopsis Seminar

Seminar Title	: Ferritin Mineral as a Potential Dietary Iron Supplement: A Safer Alternative for Iron Deficiency Anemia
Speaker	: Rohit Kumar Raut (Rollno : 519cy1012)
Supervisor	: Rabindra Kumar Behera
Venue	: Seminar Hall, Chemistry Department
Date and Time	: 03 Sep 2025 (11:00)
Abstract	: Iron deficiency anaemia (IDA), the most widespread nutritional disorder, is a persistent global health issue affecting millions, especially in resource-limited geographies. Oral iron supplementation is usually the first choice for exogenous iron administration owing to its convenience, effectiveness and low cost. However, commercially available iron supplementations are often associated with oxidative stress, gastrointestinal side effects, infections, solubility issues, gut dysbiosis and restricted iron-bioavailability in the presence of dietary inhibitors. This study aims to address these limitations by employing &lsquoferritin&rsquo &ndash a nano-caged protein, naturally bestowed with iron-scavenging/storage abilities &ndash as a non-toxic and biocompatible alternative for dietary iron supplementation. DNA protection assay and microbial growth studies demonstrate the anti-oxidative properties of ferritin in contrast to ferrous salts, highlighting its potential as a safer iron supplement over commercial counterparts. Bare ferritin proteins are fairly resistant to simulated gastric conditions, but their cage integrity is compromised under longer incubation periods and at higher concentrations of pepsin suggesting that &lsquoiron-loaded bare ferritins&rsquo could serve as a solution-based iron supplement, requiring lesser gastric retention time. To further enhance gastric stability and minimize iron leakage, ferritins were fabricated with chitosan and gelatin, two FDA approved biopolymers, which significantly improved the gastric-resilience and iron-retention ability of ferritin nanocages. Iron-release kinetics, investigated using reductive (ascorbate&ndashbipyridyl) and non-reductive (deferiprone) chelation pathways, revealed superior iron retention and structural stability in both chitosan- and gelatin-fabricated ferritins. Additionally, the impact of common dietary iron-absorption inhibitors (polyphenols) was also evaluated, demonstrating that the ferritin nanocage safeguarded its iron-mineral, thereby limiting iron access to these inhibitors under intestinal conditions. Overall, this study highlights &lsquobare/biopolymer-fabricated mineralized ferritin&rsquo formulations as promising iron supplementation strategy that could reduce the adverse effects associated with commercial iron salts while offering potential for targeted (receptor-mediated) delivery. The findings lay a strong foundation for the development of functional foods or oral formulations tailored to safely and effectively combat IDA.